Migration and Regional Convergence: An Empirical Investigation for Turkey

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Abstract

The standard growth model predicts that allowing for labor mobility across regions would increase the speed of convergence in per capita income levels and that migration has a negative causal impact on regional growth rates. Although the empirical literature has uncovered some evidence for the former implication, the latter has not been verified empirically. This paper provides empirical evidence for the negative causal impact of migration on provincial growth rates in a developing country with a high level of internal migration that is characterized by unskilled labor exiting rural areas for urban centers. We utilize an instrumental variables estimation method with an instrument unique to the country examined, and we also control for provincial fixed effects.

JEL Classification Codes: O40; R23; C23

***Keywords*:** Regional convergence; Regional growth; Internal migration; Fixed effects; IV estimation

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1 Introduction

The persistence of regional disparities in Turkey eventually brought up the question of whether there came about any convergence across these regions or not. In the last decade or so, numerous empirical studies tackled the issue of convergence across the Turkish provinces and regions. One of the first studies on this question by Tansel and Güngör (1997) finds that there is indeed convergence across the 67 provinces of Turkey in terms of labor productivity for the 1975-1990 period. In contrast, another study taking the same time span into account concludes that, in fact, there is no evidence for convergence, and instead there is divergence across Turkish provinces in terms of per capita income (Filiztekin, 1998 quoted in Temel, et al., 1999). Filiztekin finds that the only convergence that exists is conditional convergence. Temel, et al. (1999) assert that for the 1975-1990 period, in terms of labor productivity, there emerges a polarization in the sense that some provinces converge towards a low productivity level while others converge towards a higher productivity level, and hence form "productivity clubs". For the 1987-1999 period, Doğruel and Doğruel (2003) find that the degree of variation in per capita income across all Turkish provinces has not diminished over time, however they observe that it has somewhat declined across the high-income provinces. Their result points to a weak convergence only across the high-income provinces in Turkey. Karaca (2004) concludes that there emerges no convergence across the 67 provinces for 1975-2000. Erlat (2005) employs a time series approach to test for convergence across all provinces for 1975-2001. Based on unit root tests with panel data, this study reveals that there is indeed regional convergence in the Mediterranean and Central Anatolian regions as a whole. On the other hand, Erlat also finds out that various provinces in all

regions except those in the Eastern and Southeastern Anatolian regions converge towards the average Turkish real GDP per capita.

Nevertheless, none of these studies considers the contribution of internal migration to convergence, if there is any. According to the neoclassical theory with diminishing returns to factors of production and homogenous labor, if there is labor mobility, labor would flow from low per capita income regions to high per capita income regions. As a consequence, per capita income would increase in out-migration regions, while decreasing in in-migration regions, holding everything else constant. Due to this continued labor mobility across regions, the regional income gap would eventually shrink; migration would slow down and finally come to a stop. According to this point of view, migration is conducive to faster convergence across regions. In a study on convergence across the U.S. states, Barro and Sala-i-Martin (1991, 2004) conclude that this contribution, in fact, is not very significant. When they conduct similar analyses for Japanese prefectures and European states, they reach parallel conclusions. Effectively, empirical as well as historical findings suggest that the standard neoclassical theory falls short of explaining the persistent migration flows across countries and the remaining disparities between countries (Reichlin and Rustichini, 1998). According to Reichlin and Rustichini, if immigrants to richer economies have higher than average human capital, convergence might slow down, and even divergence could occur. Shioji (2001), in line with the findings of Barro and Sala-i-Martin, finds no significant effect of migration on the convergence across Japanese prefectures. In fact, Shioji argues that such a migration puzzle could be explained if migrants have higher human capital than non-migrants and if the composition effect of migration overwhelms its quantity effect. Still, Shioji fails to find evidence for a strong compositional effect of migration across Japanese

prefectures, and concludes that the causes of this migration puzzle have to be investigated elsewhere. In a study, similar to that of Barro and Sala-i-Martin (1992), conducted on Sweden, Persson (1994) finds a positive but still a weak contribution of internal migration on the convergence across 24 Swedish counties in per capita income. Soto and Torche (2004) conclude that the lack of speedy convergence across Chilean regions is due to low levels of interregional migration, which is a direct result of the social policies of the government. Among the convergence studies for Turkey, only Gezici and Hewings (2004) incorporate net internal migration rate as a regressor directly into their regional convergence analysis together with other explanatory variables such as an east dummy to capture the east-west dualism, population growth rate, and public investment to GDP ratio. However, they find no significant effect of migration on convergence for the 1987-1997 period.

Nonetheless, in developing countries where migration is generally in the form of unskilled labor from low-income agricultural regions moving into wealthier urban areas, we would expect the impact of internal migration on regional growth rates and convergence to be more significant. In our study, we test for convergence of per capita income across Turkish provinces for 1975-2000, and assess the contribution of net internal migration to convergence.

The striking disparities in per capita gross products across her provinces and high migration rates make Turkey an interesting country to study the impact of migration on regional convergence. In 2000, the per capita Gross Provincial Product (GPP) in the richest of the 67 provinces was 14 times that in the poorest province. In addition, the major urban centers in the western part of the country receive substantial flows of migration, mainly from the eastern regions, every year. For instance, between 1985 and 1990, Istanbul received a net

migration flow that was roughly equivalent to 10 percent of its population. In other words, the number of net migrants to Istanbul in this five-year interval was around 650,000 people.

There are two critical econometric issues in conducting a test of convergence that also accounts for migration. The first one is the omitted variable bias that arises when cross section data are used. This omitted variable bias results from the potential correlation between the unobserved provincial characteristics and the per capita GPP. We handle this bias by dividing the total time-span for which we have data into shorter time intervals, thereby yielding the data a panel structure. This allows us the use of regional fixed effects that takes care of the omitted variable bias. However, this comes at the cost of using shorter time intervals in measuring the growth rates. The other econometric issue is the simultaneity bias resulting from the two-way causality between growth and migration rates. The simultaneity bias is addressed using instrumental variables. In order to identify the causal impact of migration on regional growth rates, we need a source of exogenous variation in migration rates. We achieve this by using an instrument that is peculiar to Turkey, which signifies whether a province is under the state of emergency or not, along with another instrument, population density, which has been used as an instrument for migration in the convergence studies for other countries. Using these instruments, we conduct a two-stage-least-squares estimation.

Our estimation results indicate a clear evidence for the negative causal impact of migration on regional growth rates. This is the first empirical study, to our knowledge, that provides such evidence. The distinction of our results is likely to emerge from two facts: first, the compositional structure of internal migration is different in Turkey than that in developed countries studied by, for example, Barro and Sala-i-Martin. Most migrants in

Turkey are low skilled agricultural workers exiting the rural sector for employment in urban areas.[1] Secondly, the level of migration has been higher in Turkey.[2]

We find that the rate of convergence in per capita income across the regions in Turkey is 1.1 percent when the fixed effects across provinces are not accounted for. However, incorporating fixed effects into the estimation, we determine the rate of convergence across Turkish provinces to be 6.2 percent per year when migration is not accounted for, and 4.3 percent per year when migration is accounted for. That the rate of convergence is much higher once disparities in the structural parameters across provinces are accounted for using fixed effects is also reported for the U.S. (Islam, 1995; Caselli, et al., 1996). In addition, that the rate of convergence decreases once migration is accounted for concurs with the predictions of the standard growth model and is also reported in various other empirical studies (for example, Barro and Sala-i-Martin, 2004).

Another interesting new result from incorporating migration in the growth equation is that the number of provinces for which there is evidence for a steady-state per capita income level that is not lower than that of Istanbul decreases remarkably. This implies that not accounting for migration exaggerates the position of a number of provinces in terms of their steady-state per capita income level relative to that of Istanbul, which has received massive waves of migration during the time period that this study covers.

In Section 2, the internal migration process in Turkey since the 1950s is briefly described. Section 3 introduces the concepts of absolute and conditional convergence, and

[1] While 62.5 percent of the Turkish labor force was employed in agriculture in 1980, only 36 percent remained in this sector as of 2000.

[2] For example, while the absolute value of annual net migration rates for the U.S. states averaged at 5.41 percent between 1990 and 2000 according to US Census data, the same value for Turkish provinces was 6.94 percent.

the channels through which migration might affect the speed of convergence. Section 4 describes the data and section 5 presents the estimation method and results. Section 6 concludes.

2 Internal Migration in Turkey

The social and economic transformation in Turkey, which picked up pace in the 1950s with accelerating development and industrialization movements, inevitably brought about impetus to internal migration. Turkey experienced internal migration most heavily during the 1950-1985 period (Akşit, 1998). As per Akşit, during the 1945-1950 period, the net rural to urban migration was limited to 214 thousand individuals, and in the next 5-yearly period this number jumped to 904 thousand. For the next two 5-yearly periods, net rural to urban migration remained roughly the same; however, after 1965, it picked up pace and started increasing again. For example, while the share of urban population in the total population was 41.8 percent in 1975, this share increased to 53 percent in 1985 and to 64.9 percent in 2000. The contribution of internal migration in these population movements was above 50 percent (Akşit, 1998).[3]

While most of the internal migration in Turkey from the start of 1950s to the 1990s may be explained by pure economic factors, with the start of 1990s, mainly due to increased instability in the Eastern and Southeastern Anatolian regions, compromised security and

[3] Among the most significant factors of internal migration in Turkey, one can cite factors such as a high population growth rate, industrialization, mechanization of agricultural production, shifts in land ownership, inadequate educational and health services, desire to break away from traditional social pressures and feuds in rural areas, as well as increased transportation and communication facilities (Kahraman, et al., 2002).

forced migration,[4] the population in villages started migrating first into the nearby urban centers in their regions, then to the larger urban centers in the west such as Adana, İçel, İstanbul, İzmir and Bursa.

Figures 1 and 2 clearly depict that one of the major factors influencing the migration decision is the income gap across the Turkish provinces. Accordingly, migration flows occur from areas with low per capita income toward areas with high income per capita. Between 1975 and 2000, the average value of the simple correlation coefficient between the annual net internal migration rate and the initial level of income per capita was 0.72. When 5-yearly intervals are taken into account, this correlation coefficient still remains high. Nevertheless, over time we see a gradual weakening in this relationship, implying that the decision to migrate progressively becomes more affected by other factors as well and that the income gap steadily loses its relative importance in explaining internal migration. According to the data from TURKSTAT, the correlation between the net internal migration and the initial level of per capita income in the 1975-1980 period was 84 percent. However, this correlation gradually drops down to 63 percent in the 1995-2000 period.

Figure 1: Net Internal Migration Rate and Initial Income, 1975-2000

<insert Figure 1 here>

Figure 2: Net Internal Migration Rate and Initial Income, various periods

<insert Figure 2 here>

[4] For the concept of forced migration, see Gündüz and Yetim (1997), Kahraman, et al. (2002) and Aker, et al. (2005).

A salient feature of Figures 1 and 2 is that, considering the average net internal migration rates between 1975 and 2000, only 18 of the 67 provinces were net in-migration provinces. With Istanbul in the lead, provinces predominantly in Western and Eastern Marmara, Aegean, Mediterranean and Western Anatolia regions are net in-migration provinces. Indeed, 15 of these 18 provinces are those with per capita incomes higher than the Turkish average in the 1975-2000 period.[5]

3 Conceptual Framework

According to the standard neoclassical theory, economies with low initial capital per capita tend to accumulate capital at a faster rate than economies with initially high capital per capita due to diminishing marginal returns in production. An implication of this model is that countries or regions with low starting values of capital-labor ratios tend to grow faster in per capita income than the countries or regions with relatively higher starting values of capital-labor ratios. The hypothesis known as absolute convergence refers to the idea that initially poor economies grow faster than initially rich economies and eventually catch up with them. As per absolute convergence hypothesis, by assumption, no structural disparities across economies exist, and thus all economies converge towards the same steady-state equilibrium level of per capita income in the long run.

This hypothesis is formulated and reduced to the following equation by Barro and Sala-i-Martin (2004):

$$(1/T)\log(y_{it}/y_{i,t-T}) = a - [\log(y_{i,t-T})][(1-e^{-\beta T})/T] + u_{it} \qquad (1)$$

5 These provinces are Kocaeli, Istanbul, İzmir, Bilecik, Bursa, Tekirdağ, Muğla, Ankara, Manisa, Çanakkale, İçel, Eskişehir, Antalya, Aydın and Denizli, in descending order.

This equation establishes a relationship between the initial per capita income and the growth rate. Here, T is the time interval, y_{it} is the time t per capita real income in country or region i, coefficient β stands for the speed of convergence, and u_{it} represents the error terms. By taking the same value to the a-coefficient for every country or region, we impose the restriction that the level of per capita income is the same at the steady-state for all countries or regions in our evaluation. Under such a restriction, if the β-coefficient is positive, it implies that initially low-income economies grow at a faster rate than initially high-income economies If this coefficient is negative, we conclude that there is a divergence across economies.

However, the absolute convergence hypothesis is sustained only under the assumption that the regions evaluated are rather homogenous; that is, they have the same structural characteristics, the same parameters and thus the same steady-state positions. In many cases, it is not necessarily the case that the regions under evaluation have the same structural characteristics, hence one cannot expect them to converge to the same steady state position. If structural disparities between regions exist, such as differences in saving propensities, preferences, institutions, production modes or rates of technological progress, one cannot expect them to converge towards the same steady state equilibrium level of per capita income and long run growth rate. Under such differences, each region would tend to converge to its own steady state equilibrium (conditional convergence concept). Considering that the a-coefficient varies across provinces, as it is illustrated below in equation (2), allows one to capture the differences in steady state equilibria across regions (Barro and Sala-i-Martin, 1991, 1992, 2004), and gives a more accurate estimate of the β-coefficient:

$$(1/T)\log(y_{it}/y_{i,t-T}) = a_i - [\log(y_{i,t-T})][(1-e^{-\beta T})/T] + u_{it} \quad (2)$$

Conditional convergence across regions, if it exists, is likely to be affected by labor mobility across regions. According to the standard neoclassical theory, the speed of convergence increases by the exit of labor out of areas where capital-labor ratios are low – hence wage rates and capital levels are also low – into areas where they are high (Barro, Sala-i-Martin, 1991). Allowing labor mobility across regions in the standard neoclassical model implies that labor migration would push wages up in out-migration regions and pull them down in in-migration regions, thereby speeding up per capita income convergence across these regions. Accordingly, if migration speeds up convergence, then the estimated speed of convergence, β, is expected to become smaller when migration is held constant (Barro and Sala-i-Martin, 2004). This implies that if migration is an important source of convergence and conducive to faster convergence, then the estimated β-coefficient from the conditional convergence equation including net migration rate as a regressor should be smaller than the estimated β-coefficient from that excluding net migration rate as a regressor.

Migration out of lower capital-labor ratio regions would have a negative impact on regional growth rates, at the absence of a selection in terms of human capital characteristics of migrants, if the destination regions have higher capital-labor ratios. If such a selection does not exist, the out-migrants from poorer areas would have on average lower capital-labor ratios compared to the residents of the wealthier regions where they migrate to. Therefore, they would lower the average capital-labor ratios and, therefore, the growth rates of these regions.

4 Data and Descriptive Statistics

The data used in this study cover all 67 provinces of Turkey for the 1975-2000 period. The pieces of information that are used are real gross provincial products (GPP) per capita, net internal migration rates, provincial population densities (population per km²), and the state of emergency status of provinces. Real GPP per capita series for the period 1975-1986 are obtained from Karaca (2004) and for the period 1987-2000 from TURKSTAT.[6] Provincial net internal migration rates in 5-yearly intervals are obtained from TURKSTAT. Net internal migration rate is the ratio of net internal migration (in-migration minus out-migration) to mid-population in census years.[7] Provincial population densities are also obtained from TURKSTAT, and are used as instrumental variables in net internal migration estimation. Another instrument used is the state of emergency status of provinces. A list of provinces under state of emergency is available in Appendix 1. Also utilized in the estimation are regional controls. These are taken at the provincial level as well as at the more aggregated levels of 12 NUTS (the Nomenclature of Territorial Units for Statistics) Level-1 regions and the 26 NUTS Level-2 regions. The categorization of the NUTS Level-1 and NUTS Level-2 provinces is given in Appendix 2.

[6] In the post-1990 period, 14 new provinces were formed in Turkey by separation from some of the original 67 provinces. Therefore, all relevant data for these provinces after 1990 were recalculated incorporating data from the provinces split off from these provinces.

[7] Since no population census data were available for 1995, the average of 1990 and 2000 net internal migration rates is taken to be the net internal migration rate for 1995.

4.1 Descriptive Statistics

Table 1 presents descriptive statistics for the variables used in the estimation. Real GPP per capita across provinces and across time displays a significant variation in Turkey. In fact, the ratio of the highest real GPP per capita to the lowest for the 5-yearly intervals during the 25-year period is over 16. The GPP growth rates for the 5-yearly intervals averaged at 1.6 percent for this time period. Net migration rates are quite high and display a strong variation across provinces. The 5-yearly net migration rate was lower than minus 15 percent for one province and higher than 10 percent for another. More detailed information on migration rates can be seen in Appendix 3, where net internal migration rates based on 12 NUTS Level-1 regions for 5 year intervals between 1970 and 2000 are provided. Population density also displays a wide variation across provinces in Turkey. The ratio of the population densities between the most densely and the most sparsely inhabited provinces in our panel is more than 100. In our 335 observations of provinces over time, 6.9 percent of the time a province was under the state of emergency.

Table 1: Descriptive Statistics

<insert Table 1 here>

Figure 3 displays the relationship between the cumulative migration rates and the growth rates of the 67 provinces between 1975 and 2000. The scatter plot suggests a positive relationship between migration and growth, which is contrary to the prediction of the theory which claims a negative impact of migration on growth rates. This could arise due to the endogeneity of migration. Growth rates also influence migration as people migrate to high-growth provinces. This illustrates the potential problem with an ordinary least squares (OLS) estimation method in examining the impact of migration on growth rates.

Figure 3: Net Internal Migration and Growth Rates (%, 1975-2000)

<insert Figure 3 here>

5 Estimation and Results

We could estimate our growth equation using the cross-sectional data we have for 67 provinces. However, in that case we would not be able to control for the differences in the *a*-coefficient in equation (2) (in testing conditional convergence) across provinces. This would result in an omitted variable bias because the explanatory variable, the level of real GPP per capita, is likely to be correlated with the provincial fixed effects. Controlling for the provincial effects is only possible with employing the panel structure of the data by applying the growth equation to shorter time intervals. Therefore, we set T=5. This yields five observations for each province and we can estimate the provincial fixed effects.

We first test for absolute and conditional convergence in per capita income across Turkish provinces for 1975-2000. Then, we investigate the impact of internal migration on the growth rates and on the speed of convergence in per capita income across these provinces. In each case, we first explain the estimation method and then discuss the results.

5.1 Absolute Convergence

We examine absolute convergence using the structural equation given in equation (1). We rewrite this equation in the following reduced form and estimate it using ordinary least squares estimation:

$$\text{growth rate}_{it} = \alpha_0 + \alpha_1 (\text{real GPP per capita})_{it} + u_{it}$$

The β-convergence parameter is calculated from the estimated value of the reduced form parameter α_1 using the relationship $\alpha_1 = (1 - e^{-\beta T}) / T$. Delta method is used to calculate the standard errors of the convergence parameter.

Our OLS estimation results, as reported in Table 2, indicate absolute divergence in terms of per capita income. The estimated β-coefficient is -0.00478 (statistically significant at 10 percent level), implying that the rate of divergence across Turkish provinces is about 0.48 percent per year. In other words, provinces with higher initial income levels grew on average at a faster pace than provinces with lower initial income levels in this time interval. These findings agree with those in Karaca (2004).

Table 2: Absolute convergence in provincial per capita income, 1975–2000

<insert Table 2 here>

The qualitative part of the above result, that absolute convergence fails, could also be seen from a scatter-plot of the relationship between the average annual growth rates and the initial income level across provinces, which is shown in Figure 4. The positive slope of the fitted line attests to the failure of absolute convergence hypothesis.

Figure 4: Annual growth rate and initial income

<insert Figure 4 here>

5.2 Conditional convergence

The key explanation as to why we do not detect any absolute convergence across Turkish provinces might be that they do not all converge towards the same steady state equilibrium due to the structural disparities between them. In order to control for these structural differences across provinces, we add regional dummies to the reduced form

equation we used in testing absolute convergence. In other words, we rewrite the structural equation (2) – the growth equation that allows for variation in steady state level across regions – in the following reduced form

$$\text{growth rate}_{it} = \alpha_0 + \alpha_1(\text{real GPP per capita})_{it} + \sum_j c_j D_{ij} + u_{it}$$

Here, D_{ij} takes on the value of 1 if province-*i* is in region-*j*, and 0 otherwise. We carry out our examination of conditional convergence at various levels of regional controls, starting from a more aggregated level using the 12 NUTS Level-1 regions, then moving on to the 26 NUTS Level-2 regions, and finally using fixed effects for the all 67 provinces. The OLS estimation results regarding the β-coefficients are presented in Table 3 below:

Table 3: Conditional convergence

<insert Table 3 here>

Contrary to the results obtained from absolute convergence analysis, when we control for common regional effects —regardless of the level of regional controls— we find evidence for convergence. Moreover, we also find that the speed of convergence (β-coefficient) increases as we allow for a higher level of regional variation. The speed of convergence is 1.1 percent per year when we control for NUTS Level-1 regions. The speed of convergence increases to 1.9 percent per year with NUTS Level-2 regions and to 6.2 percent a year with the 67 provincial fixed effects.[8] This finding that the β-coefficient increases with fixed effects is also reported by Islam (1995) and Caselli et al.(1996), who find much higher speeds of convergence for the U.S. than previously reported when they account for regional fixed effects.

[8] Statistical significance is at 1 percent level in all three specifications.

This result also reveals that there exist important structural disparities across regions. When we examine the results from conditional convergence estimation with NUTS Level-1 regional dummies, we see that provinces in Western Marmara, Aegean, Eastern Marmara, Western Anatolian and the Mediterranean regions converge to a relatively higher level of steady state per capita income compared to that of baseline Istanbul. Provinces in Northeastern Anatolia and Mid-eastern Anatolia, on the other hand, converge to a relatively lower level of steady state per capita income compared to that of Istanbul.

Of the 66 provinces, 51 have a steady state level per capita income that is lower than that of Istanbul (with 5 percent statistical significance level). There is no evidence that Ankara, Antalya, Aydın, Bolu, Bursa, Çanakkale, Denizli, Nevşehir have a steady state per capita income level that is different from that of Istanbul. 7 provinces - Bilecik, Izmir, Kırklareli, Kocaeli, Manisa, Muğla, and Tekirdağ – in fact, have steady state income per capita levels that are higher than that of Istanbul.

As given in Figure 5, when we examine the geographical distribution of these provinces, we find that they are geographically close. Moreover, all but two of them are concentrated immediately around the four major industrial centers: Istanbul, İzmir, Bursa and Ankara. The two that are not, Antalya and Muğla, form the tourism hub of the country and are also relatively close to Izmir. Kırklareli, Tekirdağ, Kocaeli are neighboring provinces of Istanbul. Çanakkale, which neighbors Tekirdağ, is also close to both Istanbul and Bursa. Bilecik is a neighboring province of Bursa, and both are very close to Istanbul. Aydın and Manisa are neighboring provinces of İzmir, and Denizli – neighboring Aydın – is also very close to Izmir. Nevşehir and Bolu are both close to Ankara. Bolu, in fact, lies between Ankara and Istanbul. These results suggest a type of club convergence in which the provinces

surrounding the four major industrial centers plus the tourism hub of the country, all of which lies in the western part of the country, are converging to higher levels of per capita income than the rest of Turkey.

Figure 5: Geographical distribution of steady-state per capita income
<insert Figure 5 here>

5.3 Internal migration and convergence

Finally, we estimate the growth equation accounting also for regional migration. We might suspect that migration in the growth equation is endogenous because growth rates could also affect migration levels. Therefore, we first test for the endogeneity of migration in the growth equation.

To test for the potential endogeneity of migration rate, we use the Hausman test as explained in Wooldridge (2002). We first estimate the reduced form regression of migration on the covariates in the structural equation and obtain estimates of the residuals v. Then we add these estimated residuals to the structural equation and estimate it using OLS and test for the significance of the estimated residuals from the reduced-form regression. (If v is correlated with the error term, u, in the structural equation, migration rate would be endogenous.) The test result indicates that v is in fact statistically significant from zero. (p-value is less than 0.001). This is strong evidence for the endogeneity of migration rate in the structural equation.

Therefore, in order to find the causal impact of migration on the growth rate, we need instruments that would bring about an exogenous variation in migration. The instruments we use are population density and state of emergency status of provinces. Population density is a relevant instrument because it is a measure of the previous migration movements and a good

indicator of the general attractiveness of the region. This instrument has also been used in the convergence studies of Barro and Sala-i-Martin (2004) for developed countries. The other instrument, state of emergency status, is peculiar to Turkey. With the late 1980s and early 1990s, due to increased political instability and compromised security in Eastern and Southeastern Anatolian regions, state of emergency was declared in some of the provinces in these regions. The state of emergency status of a province was instrumental for out-migration not only because it made that province a less attractive place to live and to earn a living, but also because migration from rural areas was encouraged and at times forced by authorities. The population in villages started migrating first into the nearby urban centers within the same regions, then to the larger urban centers further in the west. Since this movement toward the west was sustained by the political objectives of the government rather than pure economic incentives, we can safely presume that it was independent of the growth performance of the provinces in question. During the 1987-2002 period, 11 provinces were under the state of emergency.

We use these instruments in the following two-stage least squares estimation method.

$$\text{growth rate} = a_0 + a_1(\text{migration rate}) + a_2 z_1 + u$$
$$\text{migration rate} = b_0 + b_1 z_1 + b_2 z_2 + v$$

The first equation above is the structural equation (2) to which we also add a control for migration rate. Here, z_1 is the set of exogenous variables (initial level of GPP per capita and province dummies). The second equation is the first stage of the 2SLS estimation and estimates the migration rate using the exogenous variables in the structural equation as well as the instruments (z_2).

Before moving on to the estimation results, we present the results of the test of validity of our instruments. The key requirement of the IV approach is that the instruments be uncorrelated with the error term of the structural equation. This can not be tested in a just-identified model. However, our model is over-identified as we have more instruments than endogenous variables. Therefore, we can test if some of the instruments are correlated with the structural error. This is the test of over-identifying restrictions. The test result – Hansen's J statistic—, which has a chi-square distribution with degrees of freedom equal to the number of over-identifying restrictions (one in our case), is 0.229 (p-value = 0.63197). Therefore, our instruments pass the over-identification test.

Table 4 presents the estimation results from three different specifications. The specification in the first column does not include the migration rate as a control and this is our benchmark case to examine the impact of migration on the β-coefficient. The specification in the second column includes the net migration rate; however, it is not instrumented. The last column presents the results of the 2SLS estimation. The inclusion of net migration rate decreases the speed of β-convergence. However, this drop is much more pronounced when the net migration rate is instrumented. While the speed of convergence drops to 6.1 percent per year when net migration is accounted for in the OLS estimation, it drops to 4.3 percent per year in the 2SLS estimation. That the speed of convergence decreases with the inclusion of migration is in line with the theory because migration speeds up convergence; therefore, holding migration constant we find a lower estimate for the convergence parameter. This is similar to the findings of Barro and Sala-i-Martin (1991, 2004). In their IV estimates, nevertheless, the drop in the β-convergence parameter is not as marked.

The impact of migration on regional growth rates turns out to be insignificant in the OLS estimation. This result concurs with the findings of Barro and Sala-i-Martin. What is different from their results, though, is the impact of net migration on growth rates in the 2SLS estimation. Even after they instrument for migration rates, for no country in their study do they find a negative impact of net migration on growth rates as the standard neoclassical model predicts. On the other hand, our 2SLS estimates for Turkey for the 1975-2000 period indicate a clear empirical verification of this prediction; the net migration rate has a negative coefficient that is statistically significant at 1 percent level.

Table 4: Net internal migration and conditional convergence

<insert Table 4 here>

In terms of the provincial fixed effects, there is evidence that 58 out of the 66 provinces converge to a steady state per capita income level that is lower than that of Istanbul. Only for Aydın, Bilecik, Bursa, İçel, İzmir, Kocaeli, Muğla and Tekirdağ provinces, there is no evidence for a higher or lower steady state per capita income level, and for no province does there exist evidence for a higher steady-state per capita income level. As depicted in Figure 6, Kocaeli and Tekirdağ are neighboring provinces of Istanbul; Bilecik is a neighboring province of Bursa, which is a major industrial center and the fourth largest city, and both are very close to Istanbul; Aydın is a neighboring province of Izmir, which is also a major industrial region and the third largest city; Muğla also neighbors Aydın and is the major tourism center of the country; İçel is also an important industrial center and port.

Figure 6: Geographical distribution of steady-state per capita income when migration is accounted for

<insert Figure 6 here>

These eight provinces that converge to a relatively higher level of steady-state per capita income[9] – that is not lower than that of Istanbul – are similar to those we found in the previous section when migration was not accounted for. However, one major difference is that when we did not account for migration in the previous section, the list of provinces that did not have a lower steady-state per capita income than Istanbul was longer. Moreover, there was evidence for the fact that some of these provinces had, in fact, higher levels of steady-state per capita income than Istanbul. This implies that the high level of migration that Istanbul receives each year, in fact, lowers its relative steady state per capita income level. Similarly, İçel – a city that has received significant migration waves, especially from the southeastern part of the country – improves its relative steady-state level once we account for migration.[10]

6 Conclusions

The main objective of this study is to investigate the issue of convergence in per capita income level across the provinces (and regions) in Turkey, and in particular, determine whether internal migration has had any influence on convergence in the last 30 years., A simple absolute convergence analysis points to absolute divergence across Turkish provinces at a rate close to 0.48 percent during the 1975-2000 period. That is, initially relatively poorer provinces in terms of income per capita are also the provinces with a relatively poorer growth performance. Faced with absolute divergence across provinces, it is taken into consideration that there may be substantial structural differences between them. In order to control for

[9] That is, higher per capita income than that in the rest of Turkey.

[10] İçel is the only province that was not in the list of provinces that did not converge to a lower steady state level in the previous section, but is in the corresponding list in this section once migration is controlled for.

common regional characteristics and structural features specific to each province, conditional convergence analysis is performed. When regional disparities are accounted for, there is evidence for convergence. In other words, conditional convergence hypothesis holds in Turkey. Moreover, as we increase the number of regional fixed effects by allowing the structural disparities to exist in smaller units of geographical areas, the rate of conditional convergence increases. While the rate of conditional convergence is at 1.1 percent per year with fixed effects for the 12 geographical regions, the rate of convergence increases all the way to 6.4 percent with fixed effects for the all 67 provinces. That the rate of convergence increases with fixed effects is in line with the evidence in the developed countries. From our conditional convergence analysis, we also find that compared to the baseline Istanbul region, the provinces in Western and Eastern Marmara, Aegean, Western Anatolian and Mediterranean regions converge towards a relatively higher per capita income, whereas the provinces in Northeastern Anatolian and Mid-eastern Anatolian regions converge towards a relatively lower per capita income. A similar analysis at the provincial level reveals that the provinces immediately surrounding the four major industrial centers of the country plus the provinces in the tourism hub of the country converge to a higher steady-state per capita income than the rest of the country.

After establishing that conditional convergence takes place across Turkish provinces, the impact of migration on the speed of convergence and on the regional growth rates is examined. The critical issue in incorporating migration in the growth equation as a regressor is that it is endogenous because the growth rates of provinces also influence migration rates. Therefore, a 2SLS estimation is performed using population density and state of emergency status of provinces as instruments for migration. Using this estimation method, a negative

and significant effect of migration on regional growth rates is determined, as theoretically expected. This is the first study, to our knowledge, that uncovers an empirical verification of this relationship. Previous empirical studies on this issue in the developed countries did not find any evidence for this relationship. At the same time, it is observed that holding internal migration constant decreases the speed of convergence, implying that internal migration indeed speeds up convergence across Turkish provinces. This concurs with the predictions of standard growth model.

Another remarkable new finding with the inclusion of migration in the growth equation is that the number of provinces that converge to a steady-state per capita income level that is not lower than that of Istanbul decreases. Moreover, for no province does there exist evidence for a steady-state per capita income level that is higher than that of Istanbul unlike the case without migration. In other words, not accounting for migration exaggerates the relative steady-state per capita income levels of some provinces relative to Istanbul, which has received huge migration waves. In fact, the number of provinces that are in the same club of convergence with Istanbul is much fewer than it first appears.

That migration has a strong impact on both regional growth rates and on the speed of convergence in Turkey is likely to arise from two aspects of migration in Turkey that are different from other countries studied in the related literature, most of which are developed countries. First, the level of migration rates is considerably higher in Turkey. Secondly, it is not only the level that is different, but also the composition of migration. Migration within Turkey is largely characterized by the flow unskilled workers from rural to urban areas. Hence, the increase in the speed of convergence across regions is reinforced by the fall in average skill level of migrant receiving, initially richer regions. Future studies in other

developing countries, with similar composition of migration movements, could shed more light on the impact of migration on regional growth rates and the speed of convergence.

Appendix 1: Provinces under state of emergency

Province	Year state of emergency declared	Year state of emergency ended
Bingöl	1987	1997
Diyarbakır	1987	2002
Elazığ	1987	1994
Hakkari	1987	2002
Mardin	1987	1996
Siirt	1987	1999
Tunceli	1987	2002
Van	1987	2000
Batman	1990	1997
Şırnak	1990	2002
Bitlis	1994	1997

Source: Üstel (2004)

Appendix 2: NUTS Level-1 and Level-2 Regions, Turkey

Level-1	Level-2		Level-1	Level-2		Level-1	Level-2	
İstanbul			**Mediterranean**					
	İstanbul	İstanbul		Antalya	Antalya	**Northeastern Anatolian**	Erzurum	Erzurum
Marmara					Isparta			Erzincan
	Tekirdağ	Tekirdağ			Burdur			Bayburt
		Edirne		Adana	Adana		Ağrı	Ağrı
		Kırklareli			Mersin			Kars
	Balıkesir	Balikesir		Hatay	Hatay			Iğdır
		Çanakkale			aş			Ardahan
					Osmaniye			
Aegean			**Mid-Anatolian**			**Mideastern Anatolian**		
	Izmir	Izmir		Kırıkkale	Kırıkkale		Malatya	Malatya
	Aydın	Aydın			Aksaray			Elazığ
		Denizli			Niğde			Bingöl
		Muğla			Nevşehir			Tunceli
	Manisa	Manisa			Kırşehir		Van	Van
		Afyon		Kayseri	Kayseri			Muş
		Kütahya			Sivas			Bitlis
		Uşak			Yozgat			Hakkâri
Eastern Marmara			**Western Black Sea**			**Southeastern Anatolian**		
	Bursa	Bursa		Zonguldak	Zonguldak		Gaziantep	Gaziantep
		Eskişehir			Karabük			Adıyaman
		Bilecik			Bartın			Kilis
	Kocaelı	Kocaelı		Kastamonu	Kastamonu		Şanlıurfa	Şanlıurfa
		Sakarya			Çankırı			Diyarbakır
		Düzce			Sinop		Mardin	Mardin
		Bolu		Samsun	Samsun			Batman
		Yalova			Tokat			Şırnak
Western Anatolian					Çorum			Siirt
	Ankara	Ankara			Amasya			
	Konya	Konya	**Eastern Black Sea**					
		Karaman		Trabzon	Trabzon			
					Ordu			
					Giresun			
					Rize			
					Artvin			
					Gümüşhane			

Source: SPO Website

Appendix 3: NUTS Level-1 Regions, Net Internal Migration[a], (‰)

REGIONS	1970–1975	1975–1980	1980–1985	1985–1990	1995–2000
İstanbul	127,46	67,27	56,53	99,86	46,1
Western Marmara	-5,89	-3,78	-1,18	3,08	26,1
Aegean	17,16	21,79	13,37	25,52	22,9
Eastern Marmara	18,99	38,52	27,26	41,95	15,9
Western Anatolia	40,45	9,59	5,65	8,75	15,9
Mediterranean	12,75	12,4	14,87	19,94	0,4
Mid-Anatolian	-25,1	-27,14	-23,9	-49,21	-24,9
Western Black Sea	-22,78	-18,95	-23,09	-46,54	-50,3
Eastern Black Sea	-35,94	-35,58	-36,94	-70,57	-26,1
Northeastern Anatolia	-35,69	-71,54	-58,27	-113,38	-49,8
Mideastern Anatolia	-27,95	-43,45	-32,62	-59,01	-33,4
Southeastern Anatolia	-30,81	-30,39	-20,36	-30,33	-36,2

Source: TURKSTAT Web site.

a Net (regional or, internal) migration rates do not take account of migration across provinces within the same region. Net internal migration rate is measured as the ratio of net internal migration to mid-period population.

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TABLES

Table 1: Descriptive Statistics

	Obs.	Minimum	Mean	Maximum	Std.Dev.
Real GPP per capita (TL)	335	245,375	1,062.300	4,012.403	599,169
Growth Rate (%)	335	-6,14	1,62	11,56	2,84
Net Migration Rate (%)	335	-15,17	-1,95	10,03	4,07
Population Density	335	15	79	1630	136
State of Emergency Status	335	0	0,0687	1	0,253

Note: Real GPP per capita is in 1987 prices.

Table 2: Absolute convergence in provincial per capita income, 1975–2000

	Basic Equation (1)		
	β	R^2	Number of obs.
Joint, 5 sub-periods	-0,0048*	0,0078	335
	(0,00273)		

Note: *significant at 10% significance level. Values in parentheses are standard errors.

Table 3: Conditional convergence

	Equations with 12 NUTS Level-1 Regional Dummies (2)		Equations with 26 NUTS Level-2 Regional Dummies (3)		Equations with 67 provincial Dummies (4)		Number of obs.
	β	R^2	β	R^2	β	R^2	
Joint, 5 sub-periods	0,011394***	0,0894	0,01895***	0,1451	0,06193***	0,2687	335
	(0,00385)		(0,00428)		(0,01065)		

Note: *** significant at 1% significance level. Values in parentheses are standard errors.

Table 4: Net internal migration and conditional convergence

	Net internal migration excluded (4)		Net internal migration included (OLS) (5)			Net internal migration included (2SLS) (6)		
	β	R^2	β	Migration	R^2	β	Migration	R^2
Joint, 5 sub- periods	0,06193*** (0,01065)	0,2687	0,0611*** (0,011)	-0,0001 (0,00012)	0,2725	0,043*** (0,02)	-0,0025*** (0,00096)	-

Note: *** significant at 1% significance level. Values in parentheses are standard errors. The number of observations is 335.

FIGURES

Figure 1: Net Internal Migration Rate and Initial Income, 1975-2000

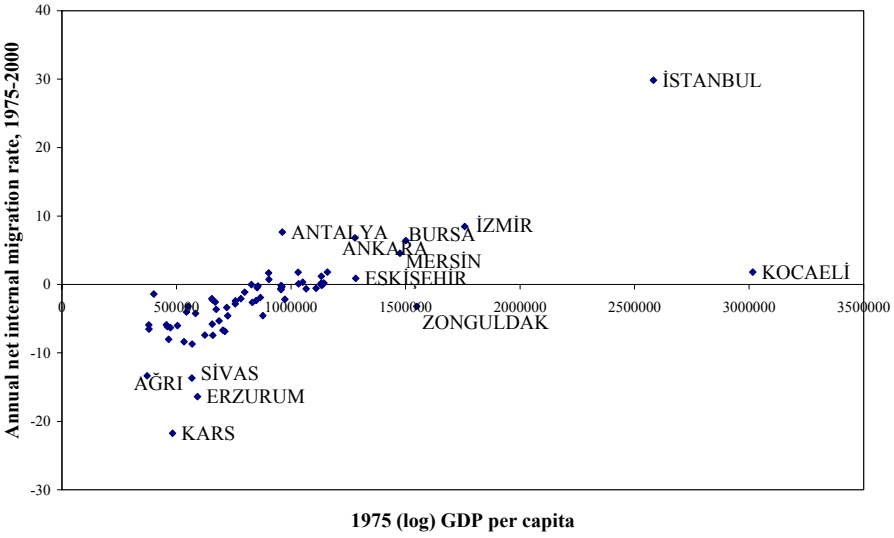

Figure 2: Net Internal Migration Rate and Initial Income, various periods

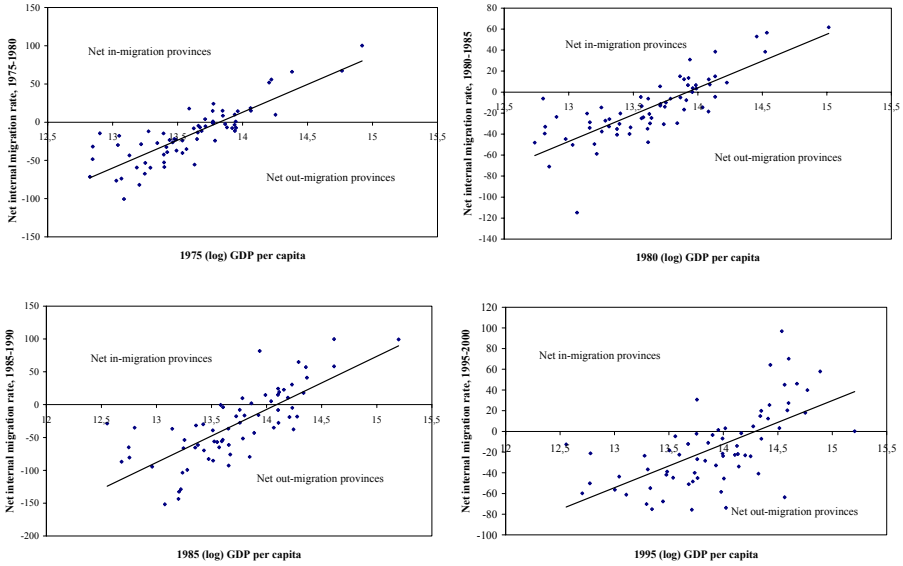

Figure 3: Net Internal Migration and Growth Rates (%, 1975-2000)

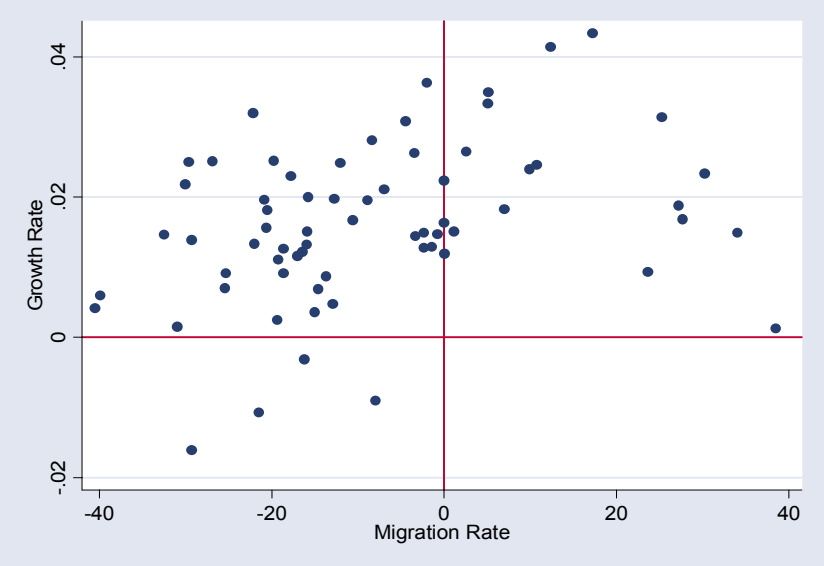

Figure 4: Annual growth rate and initial income

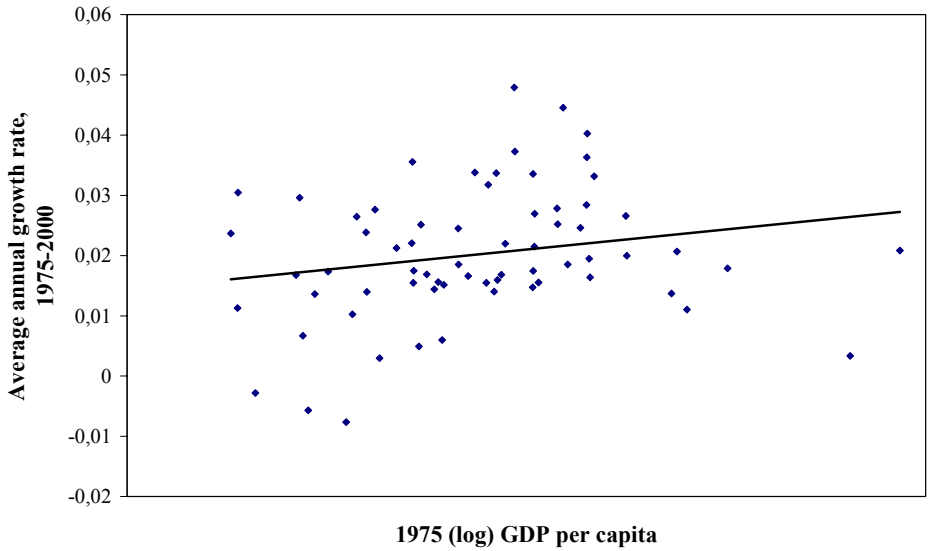

Figure 5: Geographical distribution of steady-state per capita income*

**Note*: The provinces in the dark shade are those with steady-state per capita income higher than that in Istanbul; the provinces in the lighter shade are those with steady-state per capita income that is no different than that in Istanbul. All the other provinces have lower steady-state per capita income than Istanbul.

Figure 6: Geographical distribution of steady-state per capita income when migration is accounted for *

* *Note*: The provinces in shade are those with per capita income that is no different than that in Istanbul. All other provinces have lower steady-state per capita income than Istanbul.